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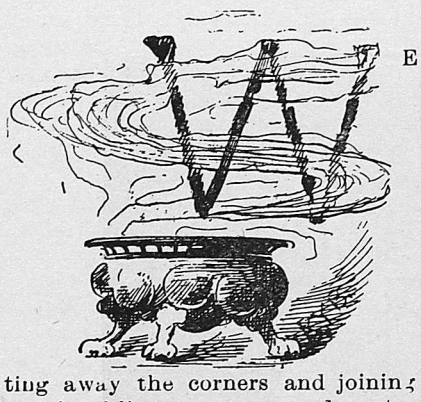
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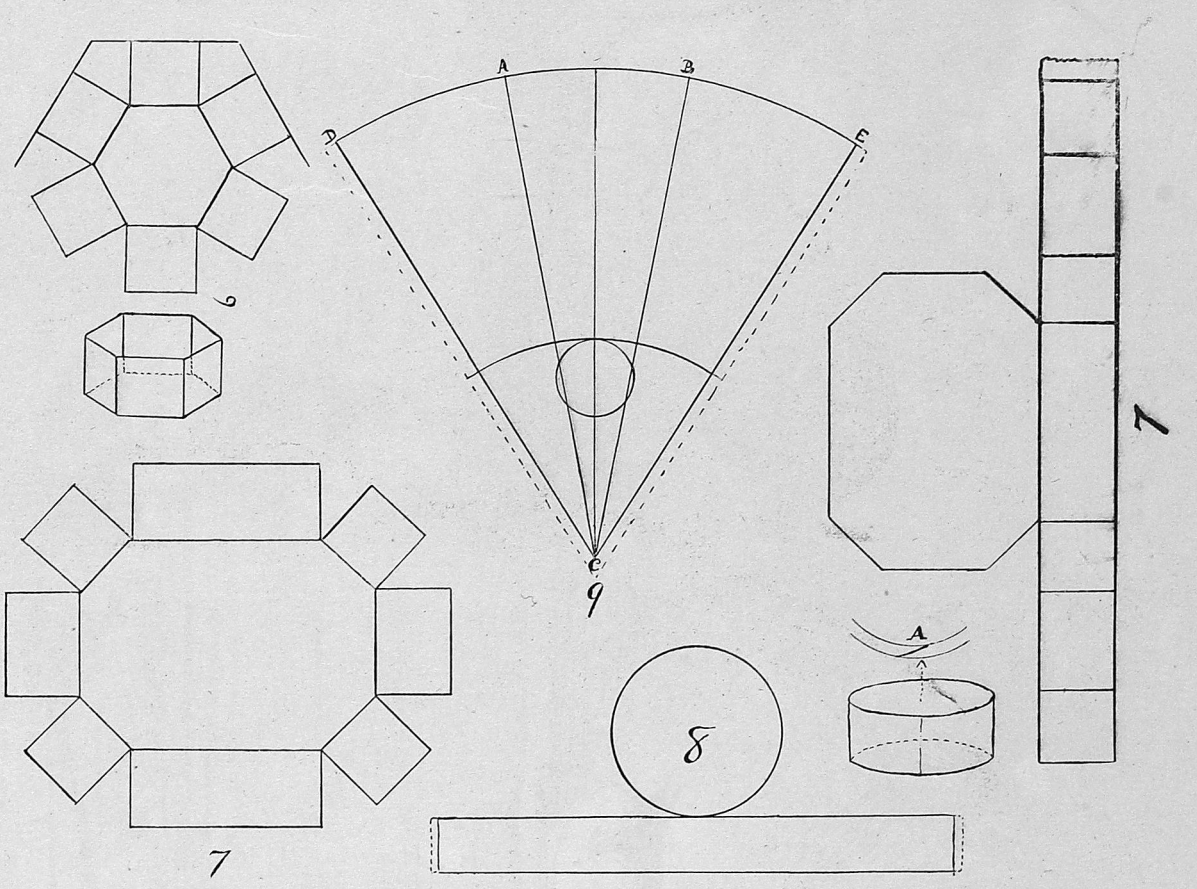
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BRASS HAMMERING AND EMBOSSING SHEET METAL.—III.

BY A PRACTICAL WORKER.



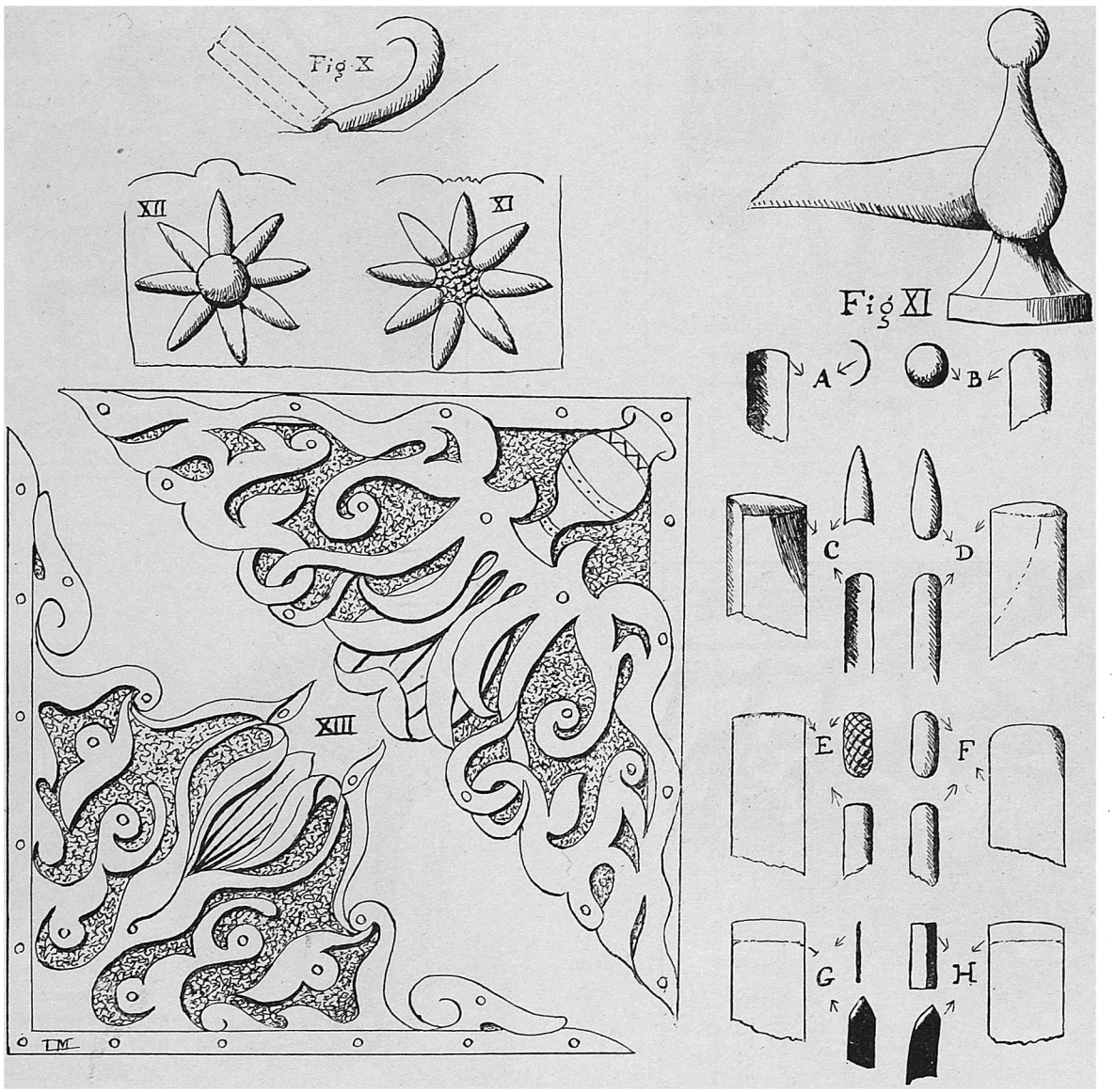
WE WILL now make ourselves acquainted with some of the various methods of forming shapes in sheet metal, made by cutting, bending and joining together. No doubt many of my readers have at some time or other made boxes and other little articles of card-board, by simply folding the four sides at an equal width, and then cutting away the corners and joining them together by means of a strip of linen or paper and paste. There are many shapes in metal formed in precisely the same way. It is necessary to draw on the material the exact shape of every plane of the work, for example, a hexagonal box, sketch (*Fig.* 6), can be made by drawing a hexagon the size required for the base, and ending upon the sides, parallelograms, equal to one of the sides, which, in this case, are exactly alike. These sides are bent to an acute angle, then braized, or soldered together. This same method applies to all polygonal figures, regular or irregular; viz.: *Fig.* 7, would be produced in box form, as *Fig.* 6, when the group of sides can be procured) are old broken foil blades, they save so much time in thinning down, being of a gradual taper. They are the most convenient, both for large and small tools. However, should these desirable foil blades not be obtainable, purchase a few feet of best tool steel $\frac{3}{8}$ of an inch by $\frac{3}{16}$ of an inch, cut this up into 9 inch lengths, which will be more convenient to hold, thus making two tools, forging one on each end. Punches assume a very great importance in the manufacture of repoussé work, The general character of a punch is that of a steel instrument, the ends of which are made the desired form to be raised by the punch, and which instrument is forcibly driven by the blows of a hammer, raising the material to the counterpart form of the figure or design. As many sizes and shapes of these tools are required as may nearly correspond with every minute detail of the most complex works. Some of them are grooved and checkered at the ends, and others are polished as carefully as a mirror so that they may impart their own degree of perfection and finish. We will now prepare to forge and make a few tools (see Tools, Fig. XI), which will suffice for the first design in repoussé. Steei requires on the whole very much more precaution as to the degree of heat, than iron. The temperature of cast steel should not generally exceed a bright red. Although steel cannot in consequence be so far softened in the fire as iron; it is therefore always more dense and harder to forge, yet the smallest available temperature should be employed, for when it is overheated or burned, it is of no more use. The best way to forge these small tools, is to heat them on a bed of charcoal, by means of the blow-pipe and bellows. In this way the steel is always under observation; but should the pupil not possess these means, it can be accomplished in an ordinary stove; however, great care



are separately turned up, or bent round an irregular octagonal base. It will now be easily seen that cylindrically formed vessels are constructed in much the same manner as the above; for instance, scribe off a circle the size of the required cylinder, mark off the band, as in *Fig.* 8; the length of the circumference of the circle, which can be obtained by passing a string round the circle, or measuring off three times its diameter, which will give the required length. This is the band to form the wall of the vessel, and should be cut the required depth; the ends of the band are left a little longer than the circumference, to allow for a chamfered edge, (see *A*, *Fig.* 8), which is thinned out with the hammer, so that when the rim is bent round the circle, the two edges will overlap each other, (as shown at *A*, *Fig.* 8), and yet only be the same thickness as the other parts of the metal. Conical forms, (as *Fig.* 9), are laid out as follows: let *A*, *B*, *C* be the given cone, from *C* as a centre, with the radius, *C*, *A*, describe the circle, *D E;* make *D E* equal in length to the circumference, *A B*, draw the lines, *D E* and *E C*, then the *D E C* will be that of the required surface of the cone, or the required opening for the mouth of a goblet, which this diagram is intended to show, as I may later on give a design for a silver drinking cup. We will now make a few respoussé punches for a beginner, which can be added to at all times to suit the requirements of the design on hand. The most convenient materials (providing they is necessary, continually taking it from the fire to see that it does not get too hot. When the steel is sufficiently heated, place it upon some hard substance, such as a smooth stone or an old flat-iron (should you not possess an anvil); strike the steel repeatedly with a hammer on the parts to be trimmed out, repeating the heating until the tool is formed somewhat into the shape required. It is then allowed to cool gradually, and when cold, held in a vise and filed up to the required shape, and then smoothed with emery cloth, care being taken to leave no edges that may cut, as every little mark on the tool will leave its impression on the material with which it comes in contact. There are many shapes that will not require to be forged, there being so many sizes and shapes of bar and wire steel on the market. You can procure that which requires the least filing. Punches after being well smoothed with fine emery cloth are ready to be hardened and tempered. Punches of an ordinary thickness ($\frac{1}{4}$ of an inch), are heated about one-third of their length and then plunged vertically in water. In this way the tool receives, by sudden cooling, its extreme degree of hardness. The tool is again polished up with emery cloth, so that you may see the color while tempering. A very convenient way to temper small tools is to heat to redness a few inches of the end of a flat bar of iron, it is then laid upon a flat place or held by its cold extremity in the vise. The work is then placed upon that part

of its surface which is found by trial to be of the suitable temperature, by gradually sliding the reverse end of the tool towards the heated extremity. Now, as the tool shows the required color (which is a yellow, tinged with purple), it should be instantly pushed off into a vessel of water. Very thin tools are heated in the blue part of the flame of a candle, larger ones are heated with the blow-pipe, applied very obliquely, and a little below the modelled end. These tools are generally thrust into the tallow of the candle, or in oil, they are then tempered either by their own heat or by immersion in the flame, below the end of the tool. The smooth faced tools are now finely polished with a piece of buff leather (which is generally fastened to the bench) having a little dust of stone rouge or tripoli dusted over the leather as a polishing medium. These polished surfaces should always be kept clean and bright, and when not in use, they should be greased with a little tallow or suet. Some of the tools here given, are not only used for raising up an exact duplicate, but are used in a gliding manner, the same as the tracer or bordering tool. For example, tool *F*, raises the form such as a stem. (See sketch, *Fig.* 10). This stem is first outlined with the tracing tool on the face of the design, it is then turned over, and raised with the tool *F*, by a continued rapid hammering

ment, that can be worked from both sides of the metal, this is termed flat chasing. I give for this practice two box cover mounts (see sketch *Fig.* 13). Take a piece of 22 gauge brass, trace off the design, do this very carefully, and if you make the least error, rub it out and correct it, do not rely on making corrections with the tracer, for that which may seem trifling in the drawing will look very bad when raised in the metal. The metal used should always be large enough to allow of a margin for squaring up. Do not cut it out until finished. The work is now placed on the foxing block, and when cold, traced with a medium sized tracer, carefully copying every line. Try to produce the effect of an old engraving. Go over the lines very lightly at first, striking the tool rapidly, and at the same time, slowly glide it along. Start with the bolder parts first, taking them down in one surface, leaving all detail till the general effect is obtained. Do not be too hasty to produce an effect, or your work will be very irregular and raised in formless lumps. This is all important; yet there are very few pupils, who, if left to themselves, will not jumble their work up, in their eagerness to produce something to show. I will here remark that in a true design for repoussé work, no shading lines, or marks to represent shading, should be put in, as all the effects of light and shade must be



with the repoussé or chasing hammer (see tools, *Fig.* XI), gliding the tool very slowly along between the lines (those which were raised by the tracer), slanting the face of the tool in the direction in which it is going. It is advisable sometimes to use a little oil, which will help the tool to work more freely. Tool *G*, is a thick tracer, and is used for the fibres of large leaves, it is also very useful for correcting mistakes. Tool *H*, is an underlining tool, and is used to correct mistakes made by tool *F*, and likewise to raise the forms of stems up sharp, by hammering round the outside edges, as shown at section sketch (*Fig.* 10). Tool *A*, is a half circle for sharp curves, and for outlining ball forms, as the centre of a flower (sketch *Fig.* 12). The student should have quite a number of these in various sizes. Tool *B*, is for raising ball forms. They can be bought in sets of twelve punches. You can then make your half-circle tools the same size to use with them. Do not buy the concave tools that the dealers may offer you, as they are not deep enough, and are not so handy as the half circle ones. Tool *C*, is for the leaves of flowers (see sketch *Fig.* 12), and similar forms. Tool *D*, is also used for flowers, as in sketch *Fig.* 11. We will do a little repoussé ornaobtained by proper modelling. Therefore, very little more than the mere outline should be traced. Use a moderately thick, and not too sharp tracer; when little relief is required, trace lightly, and more strongly in those parts that are to be highly raised. When sharp relief edges are required, use tool *H*, just inside the outline. Now take the work off the block, and flatten it out with a wooden mallet, do not strike too hard, anneal if required. Put it back again on the block, face uppermost. Now trace round the outline with tool *G*. Touch up the modelling with a fine tracer, smooth away all roughness, and then put in the back ground with matting tool *E*. Now, with a sharp pencil or nail, make the little holes which are to fasten the designs on the box covers, using round headed, brass escutcheon pins. The work is now ready to be finished, so with a sharp chisel, cut away the metal round the inside of the design. Take off the block and clean away the cement. Cut the outside edges perfectly square with the shears. File off the burrs around the holes, and also file all the edges smooth.

(To be continued.)